



# ECONOMIC RESILIENCE OF G20 COUNTRIES DURING COVID-19 PANDEMIC AND THE IMPACT OF RESILIENCE ON THEIR ECONOMIC GROWTH

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## ABSTRACT

This paper is an effort to understand the aftermath of global health crisis that unleashed economic turbulence, the world over, due to COVID-19. A pandemic of such huge dimension and consequences not only caught everyone unaware but the epitome of science and medicine advancement also could not lessen the speedily advancing health hazards. All countries had to put in Herculean efforts to overcome this crisis but India being the most populous had to face a humongous task. Initially the challenge was how one can resist the economic shock and later it was how fast one can overcome the crisis. This paper compares the performance of Indian economy with some prominent G20 countries with respect to unemployment rate, growth rates, foreign direct investment and economic inequality. We compare 2019, considered as normal year with 2020, the hardest hit year due to Covid 19. We have also tried to explore the resilience index of all G20 countries, by calculating both the resistance index and the recovery index of the crisis. Finally, we explore the impact of resilience index along with household consumption expenditure, capital formation and exports on the growth rate of real Gross domestic product of G20 countries. We adopt an econometric approach, using multiple linear regression for analysis. Based on our analysis, appropriate proposals have been formulated for future course of actions that will enhance the future economic prosperity of G20 countries.

**KEYWORDS:** Covid 19, Resilience Index, Economic Inequality, G20, Growth Rate

## 1. INTRODUCTION

G20, is the premier forum for international cooperation that brings together the world's major advanced and emerging economies. G20 countries together represent around 90 percent of global GDP, 80 percent of global trade, and two thirds of the world's population. On December 1st 2022, India assumed the G20 presidency with an aim to secure global economic growth and prosperity.

It has come at a time when the world is surrounded by the after effects of the pandemic and economic uncertainties. Widespread vaccinations and continuing policy support have set the stage for strong recoveries in many of the G20 countries post Covid 19 pandemic. Some of them managed to generate a relatively high GDP per capita in comparison to other G20 countries in spite of their high exposure to exogenous economic shocks.

The causes of the different responses to the crisis of 2020 are often thought to include, among others, macroeconomic variability across countries. To get a better understanding of this diversification, here we attempt to see how far this variability captures the difference between pre pandemic and pandemic onset year. On other hand, this reality can also be explained in terms of the ability of few countries to build its resilience in the face of Covid 19. Economic resilience is defined as the ability of an economy to cope and recover from various shocks, of economic/political/environmental nature, either by returning to the old path of development or moving on to a new, better one (Pan et al, 2023). This paper tries to focus on this aspect

by constructing the resistance and recovery index and hence, tries to show how this index with other economic determinants explains the GDP of all G20 countries, considering 2022 as the post covid year.

The novelty of this research consists in the following aspects: (a) the choice of the G20 countries, little studied in earlier literatures; (b) comparing their macroeconomic aspects from pre to post covid year, not covered at one place so far (c) the study of the resilience of the 43 countries, included in G20 cohort, which has been tried for the first time; (d) the analysis of the impact of the resilience index along with other economic variables on GDP of G20 Countries, an initiative of the first kind.

## 2. Literature Review

A country is considered to be economically successful not only for its high growth rate but also how resilient it is in maintaining this high growth rate during the situation of crisis. According to Guillaumont (2009), economic resilience is the ability to recover from a shock. This can be further bifurcated into two specific subsets: (i) robustness to resist, absorb and accommodate shocks and (ii) readiness to adapt, transform and recover Martin, et al (2016) believes that the resilience of regional economy to the impact of crisis should include four aspects. They are resistance (sensitivity and degree of response to the impact of crisis), resilience (speed and degree of recovery from the impact of crisis), the ability to readjust (the ability to modify the structure of industry, technology and labour force

in the face of the crisis) and the ability to create the economic growth path (the ability to open a new stable growth path after the impact). Resilient economic structures hinder the belief that economic shocks have large and persistent effects on income and employment levels and hence tame economic fluctuations (European Commission, 2017). In IMF's views, "resilient economies combine strong, sustainable, and inclusive growth with the ability to absorb and overcome shocks" (IMF, 2016).

Shocks are sudden major disturbances, such as recessions, natural disasters, major industrial closures and pandemics. Shocks felt in regions can originate either regionally or globally, as well as they can be isolated occurrences or experienced globally (Martin & Sunley, 2015). When hit by a shock, regional economies can either be resistant (i.e., marginally impacted), resilient (i.e., severely impacted, but recovers) or non-resilient (i.e., severely impacted and does not recover) (Hill et al., 2012). Although shocks are typically discussed as negative events, they can be seen as positive occurrences if they enhance regions' economic growth trajectory through mechanisms of adaptation and adaptability (Sutton & Arku, 2022). Regions may receive increased public and private attention during times of economic crisis, resulting in increased resource accumulation, such as financial aid, and infrastructural and organizational development, enhancing regions' economic landscape and building resiliency (Banica et al., 2020). Thus, shocks can be seen as opportunities for regions to grow and transform in the long run.

Countries have suffered different categories of shocks from time to time like rising global interest rates, recessions in advanced economies, sharp deterioration in terms of trade, sudden interruptions in capital inflows and pandemics. The effects of these shocks are different between states and especially between regions, with great differences being observed even within the same state. The analysis of a number of US cities (Di Caro, 2015) hit by shocks shows that there are several common factors, which influence resilience: infrastructure, innovation, skilled workforce, adequate financial system. The UK regions analysed (Rose & Krausmann, 2013) for the period 1970–2010 concludes that resilience is a dynamic process consisting of several stages: resistance, recovery, renewal, and reorientation, with different repercussions on companies, individuals, and institutions. Performing an assessment at the EU level during 2000–2018, World Bank (2019) highlights that resilience and institutions are strongest in Western European countries and weakest in Southern Europe.

The concepts of resilience were largely used both conceptually and empirically in research linked to environmental degradation, population exposure, and physical assets (Kaly et al. 1999; Noy & Yonson, 2018). In recent times, (Oprea et al. 2020) phenomenon of regional resilience for seven Eastern European states was compared to the EU region using resilience index for two distinct periods: the period of economic downturn during 2008 financial crisis, in which the phenomenon of resistance manifested itself and the recovery period<sup>1</sup>. It also tried to find out the determining factors of resilience for the studied regions with respect to the size of the manufacturing

sector, the services and public administration, entrepreneurship and the human capital. Acharya and Parwal (2020), report a vulnerability index to identify vulnerable regions in India on the basis of infrastructural and population features. A global analysis to explain why some countries and regions have responded relatively better than others has been also addressed by providing COVID-19 economic vulnerability and resilience indexes (Samba et al, 2021).

The economic impact of Covid 19 has also been analysed by various studies. With the use of a high frequency indicator to assess the economic implications of the pandemic in the United States and Europe at the initial stage, it is established (Chen, et al., 2020) that the sampled countries with a higher outbreak have also experienced substantial economic losses. The ripple effects of pandemics across a regional economy are studied using an input–output model (Santos 2020). The impacts of pandemic-induced workforce disruptions are assessed using economic losses as well as inoperability, which measures the extent to which sectors are unable to produce their ideal level of output. The epidemiological and economic impact of COVID-19 spread in the US under different mitigation scenarios, comprising of non-pharmaceutical interventions has been studied and shows that sectors that are worst hit are not the labor-intensive sectors such as the Agricultural sector and the Construction sector, but the ones with high valued jobs such as the Professional Services (Jiangzhuo, et al., 2021). Data-mining techniques of nonparametric classification tree and hierarchical clustering approaches analyze the economic reactions taken by policymakers during the coronavirus in G20 countries<sup>2</sup>. The result shows fluctuations in GDP caused stagnation or inflation due to postponed expenses and government policies related to monetary emissions (Taylan et al, 2022).

Post-pandemic recovery has differed across countries. But what clearly worked for India's economy is the strength of its domestic demand. Post-pandemic quarterly trajectories of consumption and investment in 2022 have already crossed their pre-pandemic paths<sup>3</sup>. We have not come across any research paper yet that tries to find out what was the impact of the demand side factors on the GDP of the G20 countries in the post covid year, 2022. This attempt is the first of its kind for this paper.

The present study contributes to the extensive literature by comparing few macroeconomic indicators of G20 countries due to Covid shock, along with calculation of resilience index and an empirical analysis of the factors impacting their real GDP. The rest of the study is structured as follows. Section 3 explains the methodology of analysis and sources of data set. Section 4 gives the results and discussion of our analysis with three subsets: a macroeconomic comparison of G20 countries, a discussion about the results of resistance and recovery index., finally, an analysis of the empirical result of multiple linear regression. Lastly, in section 5, we conclude with implications and future research directions.

### 3. Methodology and Sources of Data

In this study, we initially compare G20 countries, over the

period 2019 to 2020. This is to analyse how few macroeconomic variables has changed as Covid 19 hit in 2020 in comparison to pre covid normal year 2019. For this, we consider Gini Index, Unemployment Rate, GDP growth rate and foreign direct investment. This helps us to find out the variability among all G20 countries with respect to these indicators. In the next part, we consider calculation of economic resilience index as an aggregate of two elements: resistance index (measuring the ability of a country to absorb Covid 19 shock) and recovery index (measuring the ability of a country to bounce back from the shock). We have used real GDP as the indicator for index. This is because it has become widely used as a reference point for the health of national and global economies. When GDP is growing, workers and businesses are generally better off than when it is not. Also, GDP reacts faster and more convincingly to shocks. We have divided the entire three-year period, since the year of outbreak of Covid till 2022, as the resistance period, 2020 to 2021 and the recovery period, 2021 to 2022. Although recovery may require some more time to come to full swing, yet we have considered the short run recovery for our analysis because on March 2021, it was observed by OECD that the world economy was bouncing back far more quickly than expected (CBC, 2021).

The G20 countries are the locomotives of economic growth, representing 64 percent of the global population including 4.7 billion inhabitants and more than 90 percent of the GDP. Thus, the G20 countries have the largest economies in the world, which means they have large firms and infrastructure capable of deterring the spread of this pandemic. We tried to assess the economic performance of G20 countries by comparing their resilience index. Our hypothesis is that the more resilient an open economy is, the more it will have higher growth rate on recovery due to increased demand post pandemic. The methodology of the analysis consists of two steps. In the first step, we have constructed the resistance and the recovery index. In the second step, we did a multiple regression analysis using OLS (ordinary least squares is a type of linear least squares method for estimating the unknown parameters in a linear regression model) technique.

Following the established studies in the field, we have constructed the index of the G20 countries, separately for each of the two periods (first period, resistance, and second period, recovery). Also, for a better understanding of the G20, we have considered all the regions of European Union separately along with other G20 countries. This is in order to remove any possibility of outlier from data which can appear if European Union is considered as an aggregate. The index is constructed as per the following equation:

$$Index^i = \frac{\left\{ \frac{GDP^i_t - GDP^i_{t-1}}{GDP_{t-1}} - \frac{AgGDP_t - AgGDP_{t-1}}{AgGDP_{t-1}} \right\}}{\left\{ \frac{AgGDP_t - AgGDP_{t-1}}{AgGDP_{t-1}} \right\}} \quad (1)$$

Where  $GDP^i$  is the real GDP of country  $i$  in trillions,  $AgGDP$  is the aggregate GDP of the G20 countries,  $t-1$  is the initial period of analysis (2020 for resistance index and 2021 for the recovery index) and  $t$  is the end period (2021 for the resistance index and

2022 for the recovery index). The resilient economies are those where the change of GDP is greater than the change of GDP of the G20 countries (resistance  $> 0$  and recovery  $> 0$ ), and the non-resilient economies are the ones where the change of the GDP is smaller than that of the G20's GDP change (resistance  $< 0$  and recovery  $< 0$ ).

The second step of the analysis considers the influence of resilience index (an aggregate of resistance index and recovery index), growth rate of the household final consumption expenditure (including non-profit institutions serving households), growth rate of capital formation<sup>4</sup> and growth rate of export on growth rate of real Gross Domestic Product of all G20 countries in the year 2022. Economic paradigm encourages competition for limited resources. A central premise of this is that GDP growth is the yardstick for economic success. However, it faces regular challenges due to various shocks. It is important to reduce setbacks by investing in resilience, as it helps an economy to grow fast even during adverse situations. Demand picked up globally as vaccination coverage started increasing along with control in spread of covid 19. The speed of increase in household demand can influence the pace of the recovery of an economy. On the other hand, dependence on a narrow range of exports gives rise to risks associated with lack of diversification, and therefore exacerbates vulnerability of an economy. Thus, increase in exports have a positive influence on the post pandemic growth of an economy. Government's policy thrust on quickening virtuous cycle of growth via capex and infrastructure spending increases capital formation in the economy. Covid 19 has resulted in increased capital formation for every region. Such investment plays a strong role in influencing post covid growth rate.

The OLS regression used here is as follows:

$$\log(GDP)_i = \beta_1 + \beta_2(resind)_i + \beta_3 \log(hhcexp)_i + \beta_4 \log(capform)_i + \beta_5 \log(exp)_i + \epsilon_i \quad (2)$$

Where  $GDP$  is the real gross domestic product of  $i^{\text{th}}$  country in trillions of dollars,  $resind$  is the resilience index,  $hhcexp$  is the household expenditure as percentage of GDP,  $capform$  is the capital formation as a percentage of GDP,  $exp$  is the gross exports of  $i^{\text{th}}$  country in trillions of dollars and  $\epsilon$  is the population error term. For multiple regression analysis, we have considered the data for 43 countries, that includes twenty-four countries of European Union, for the year 2022. We have collected data from Statista, World Bank, IMF and OECD website.

## 4. RESULTS AND DISCUSSION

### 4.1 Macroeconomic Comparison

#### Inequality

Inequality reflects the gap between rich and poor. Increasing inequality is the price economies pay for increasing GDP. The debate between efficiency and equity has always been there. Using resources efficiently increases income but this also increases inequality, though it is not always true. Inequality has social and psychological consequences, though it does not always imply increasing poverty. With rising incomes, the rate of increase of top 10 percent is higher than the bottom 10 percent which gets reflected in wider gap between the



two. The striking feature of inequality was evident in the countries, especially during the early phase of crisis in which health facilities and safeguard against economic downturn was available to the affluent and poor was confronted with an unsure future. The inequality of access to resources continued till Governments reined the drift and started a universal welfare program. The Covid-19 period and its aftermath shows no change in inequality, for most of the countries, in our study, and in few cases, there has been a marginal decline in inequality (Argentina, Brazil, Mexico and Russia) as evident in table 1. Due to lock-downs and other restraints, falling GDP was the global phenomenon which lessened the rich-poor gap by a small fraction. The income of many enterprises and individuals fell significantly, narrowing the gap between the high income and low-income groups. The inverted-U Kuznets curve can be referred to explain the trend.

Indian experience during the pandemic shows that wealth inequality decreased. Due to consumption smoothing, inequality reflected in consumption also decreased, though to a lesser extent. Higher sensitivity of corporation's income to aggregate fluctuations may help to explain a portion of the decline in income among the wealthy. The demand for labor in the professions held by the wealthy is also likely to have decreased more than the demand for the goods and services provided by the less privileged.

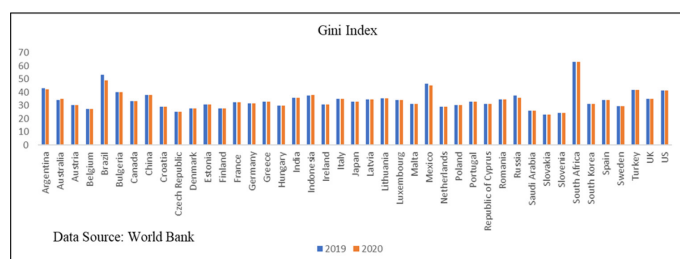


Table 1

### Unemployment

The job market is diverse across countries and within a country. In a situation, like never before, the most pressing need was to halt the spread of contagion and save lives. In the process several sectors simply came to a standstill. Frontline workers, health industry and food were the only pillars that needed and were given Government support in the initial phase. Vaccine production and vaccination policy was in the forefront. Different countries have different exposure to the crisis and different cushion to take the shock but for some time, even if briefly, there was a job crisis. The unorganized sector experienced the major brunt of the crisis. Women and youth were severely affected.

Unemployment and GDP growth rates have an inverse relationship. In an obvious turn of events declining growth rates led to rising unemployment rates. The relationship is not one-on-one between the two but every one percent reduction in growth rates lead to less than one percentage increase in unemployment. The unemployment rate (as a percentage of total labor force) shows similar trends. If 2019 is considered a pre-crisis normal year and 2020 as the severely critical year,

the unemployment rate has increased in countries, and then fell back to the 2019 level. This can be observed from table 2.

The International Labour Organisation defines labor force as comprising of people working and not working but looking for jobs. As per this definition many job seekers went out of the labor force as it became difficult to look for work when those already employed were fast losing their jobs. Thus, data picked up the numbers as improvement in unemployment scenario in countries like France and Italy. These countries also started many compensatory schemes to mitigate the adversities of unemployment. In OECD countries job retention policies were pursued by employers to lessen the effects.

In almost all countries the unemployment rate fell from the 2020 level in 2021 when economic recovery started. Stimulus package in Greece has brought down unemployment rate significantly in 2021 from 2020 levels. According to the National Statistical Office's (NSO) most recent annual Periodic Labour Force Survey (PLFS), India's unemployment percentage fell to a five-year low in July–June 2021–22, to 4.1 percent. This bounce back is consistent with the trend of recovery of economy reflected in growth rate of output.

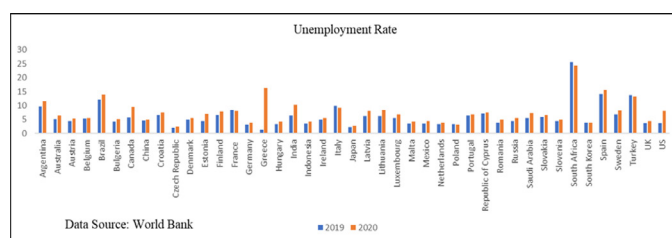


Table 2

### Real GDP Growth Rate

In the Covid hit year of 2020, countries experienced negative growth rates except China and Ireland. Real GDP is estimated to have grown by 3 percent in Ireland in 2020, the only positive growth rate in the EU, boosted by exports from multinational companies specializing in medical equipment, pharmaceuticals and computer services. However, China's growth rate was low in 2020 as compared to 2019 even if it was positive. The negative growth rate is clearly attributed to the close down of economies or sluggish businesses. When entire focus was only on saving lives and containing the spread of COVID-19 the measures adopted restrained the economic growth. Contact industries, experiencing the brunt of public health restrictions and voluntary social distancing, like hospitality, tourism and entertainment were hardest hit. Improvised formats in the form of home delivery and OTT platforms emerged but initial phase saw slow growth. Telecom industry and online payment mode were the major gainers during this critical time as work from home needed communicating technologies and devices. Opportunity came in adversity as evident in case of pollution and environment which got positively impacted due to less factory production, fewer transportation and less consumption in the wake of the crisis.

The interim period of decline has shown different intensity in different nations, depending upon their pandemic policies

and pre-existing economic and health infrastructure. Some countries have moved back to their pre-crisis growth rates, but the level effect of shrink in economies shall remain forever.

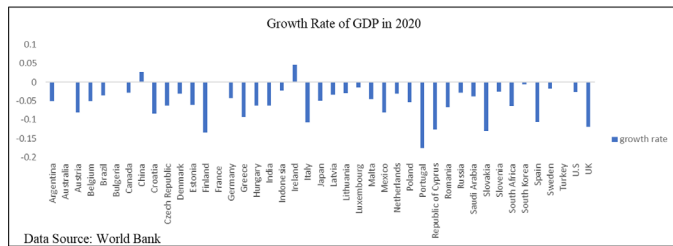


Table 3

### Foreign Direct Investment

FDI is an indicator of confidence perception that foreign businesses have in an economy. Higher FDIs shows that world can trust this economy with its money and other invested resources. Since the last two decades of last century the global movement of goods, capital and human have been liberalised and consequently FDIs have seen a decent growth. Health crisis of a herculean enormity has significantly affected FDI. The developing countries are considerably under pressure. These countries get foreign investment in the primary sector and prices of primary products fell due to demand - supply mismatch during 2020s. This led to massive outflow of FDIs from developing economies to back home. Pandemic reports in terms of spread of COVID-19, possibility of quick containment, Covid deaths and other related news had direct effect on new FDI inflow or outflow of existing FDI. This investment, like any other investment, rests on the strength of an economy's performance. GDP is the most evident indicator of economic potential. There exists a direct relationship between FDI and GDP growth. World GDP contracted by more than 3 percent but FDIs dropped by more than 30 percent. Majority of economies experienced negative growth rates and therefore FDIs contracted. Since this was a global phenomenon with temporary impact FDI moved to economies with stable credentials. The world reposed its faith in India and China where FDI increased considerably. India has a 13 percent increase in FDI during 2020, this is also because of the leadership role India played in combating Covid crisis and sharing the learnings and health supplies with the world.

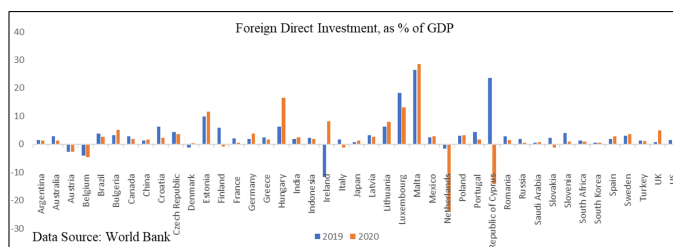


Table 4

### 4.2 Resistance and Recovery Index

There are significant differences in the resistance and recovery index of G20 countries, as presented in Table 5. For convenience, we have separated the European Union countries (which is in the lower part of the table) from the rest of the G20 countries (which is in the top part of the table). The calculation of both

the index are according to equation (1). Countries having both index positive can be considered as resilient and countries having both indices negative are considered non-resilient.

Countries	Resistance Index	Recovery Index
Argentina	1.32	-2.58
Australia	-0.62	0.34
Brazil	-0.23	-0.13
Canada	-0.28	0.12
China	0.28	0.06
France	0.25	-4.00
Germany	-0.59	-0.61
India	0.37	1.34
Indonesia	-0.39	0.79
Italy	0.09	0.10
Japan	-0.72	-0.53
Mexico	-0.24	-0.15
Russia	-0.23	-2.26
Saudi Arabia	-0.49	1.79
South Africa	-0.19	-0.31
South Korea	-0.35	6.03
Turkey	0.78	0.67
US	-0.06	-0.43
UK	0.18	0.58
Austria	-0.31	1.14
Belgium	-0.17	-0.43
Bulgaria	-0.01	-0.19
Finland	-0.39	-2.27
Latvia	-0.45	-0.43
Czech Republic	-0.42	-0.60
Republic of Cyprus	-0.09	-0.07
Croatia	0.44	1.85
Greece	0.09	1.20
Hungary	0.58	0.04
Ireland	1.46	1.63
Malta	0.51	0.48
Poland	0.16	0.29
Slovenia	0.21	1.04
Denmark	-0.01	0.01
Estonia	0.35	-9.73
Lithuania	0.59	-1.00
Luxembourg	-0.09	0.38
Netherlands	-0.33	0.38
Portugal	-0.04	0.96
Romania	-0.15	0.74
Slovakia	-1.55	0.43
Spain	-0.07	0.71
Sweden	-0.79	0.85

Table 5: Resistance and Recovery Index

From the results derived as per the above table, we divide the countries into four sections: resilient, non-resilient, resistant

poor but recovery good and resistance good but recovery bad. This is shown below in table 6.

Resilient	India, Italy, Turkey, UK, China, Croatia, Greece, Hungary, Ireland, Malta, Poland, Slovenia
Non-Resilient	Brazil, Germany, Japan, Mexico, Russia, South Africa, US, Belgium, Bulgaria, Finland, Latvia, Czech Republic, Republic of Cyprus
Resistant but poor recovery	Argentina, France, Estonia, Lithuania
Non-Resistant but good recovery	Australia, Canada, Indonesia, Saudi Arabia, South Korea, Austria, Denmark, Luxembourg, Netherlands, Portugal, Romania, Slovakia, Spain, Sweden

**Table 6: Resilience of G20 Countries**

Out of total 43 countries, only 12 emerged to be resilient in Covid 19 crisis while 13 of them are non-resilient. India, Italy, Turkey, UK and China are the non-European countries that are resilient. Among the rest, we find 14 countries could not withstand economically the shock of Covid 19 but have recovered well from the shock. Its only four countries that resisted the shock well but yet not recovered well.

#### 4.3 Regression Results

In the following table 7, we analyse the influence of the determinants on the growth rate of real GDP in 2022 for G20 countries according to equation (2). Apart from resilience index, all other variables are in logarithmic form. The linear regression analysis is corrected for heteroscedasticity and autocorrelation of the standard errors that could exist in the dataset. The histogram of the residuals satisfied normality assumption. Scatter diagram of the fitted vs residuals showed the results to be well fitted.

Dependent Variable:  $\ln \neg(GDP)$

Variable	Coefficient	t-statistic	Prob
const	-21.9500	-9.703	0.0000***
resind	0.0374097	1.424	0.0810*
$\ln(hhcxp)$	3.04140	8.293	0.0000***
$\ln(capform)$	0.911107	1.949	0.0588*
$\ln(exp)$	1.23434	23.8	0.0000***
Number of Observations	43		
R-squared	0.9062		
Adjusted R-squared	0.8963		
F (4,38)	232.1003		0.0000***

**Note:** \*\*\* and \* indicate statistical significance at 1% and 10% levels respectively.

**Table 7: Results of Multiple Linear Regression**

We observe that the entire regression line is significant at 1percent level of significance. The value of R-squared is 0.9062. Hence, the line explains 90 percent of variation in the dependent variable. The result shows that for a country that improves its resilience index by unit value, the estimated mean growth rate of real GDP increases by 3.74 percent. This is approximately

same (3.04 percent) as the elasticity of household consumption expenditure on real GDP. However, export also has a high influence on the growth rate of real GDP, with export elasticity of 1.23 percent. Capital formation likewise has a positive influence (.91 percent) on real GDP but not as high as export. This can be because impact of capital formation requires a longer period of time to show its actual influence on GDP.

All the explanatory variables are individually significant in the analysis and the sign of the coefficients are as per their prior expectations. The result of White's test of heteroscedasticity test showed the probability at 0.7796, which means there are no heteroscedasticity problems.

#### 5. Conclusion

India is one of the high scorers in resilience index, particularly highest among all non-European Union countries. The bounce back by India has been dignified in comparison to many developed countries of the world. Real GDP growth (annual percentage change) in 2021 has been 8.7, in 2022 it was 6.8 and projections for 2023 is 6.1. These numbers are much higher than many G20 countries (Argentina 10.4, 4, 2; US 5.7, 1.6, 1; Italy 6.7, 3.2, -0.2; Japan 1.7, 1.7, 1.6 in the years 2021, 2022 and 2023 respectively).

India's way of tackling Covid 19 shock has helped her to become economically resilient. The Government adopted a pre-emptive, pro-active, whole-of-government, whole-of-society strategy to prevent infections, save lives and minimize impact (Government of India, 2021). The effect got amplified with the country's large and spatially diversified economy, as well as diversified production structure that is not dependent on a few products, commodities, or natural resources. In addition, India's diversified trade basket and broad range of trading partners has helped wherein a slowdown in any one part of the world do not result in a large impact on India. Thus, India can guide other G20 countries to build up a resilient economy in order to tackle head-on any future external shocks.

The study complements the ongoing research for the economic prosperity of G20 countries. The constructed resistance and recovery index and the segregation of G20 countries pertaining to four scenarios of resilience will help each country to know their own risk managing ability. The established findings have obvious scholarly and policy implications. On the scholarly front, the scientific community has been provided with indexes via which to understand how countries have been affected by and/or resisted the COVID-19 pandemic. On the policy front, this will guide them to build a strong foundation of resilience for any future shocks. The positive impact of resilience index along with household demand, capital formation and export concentration on real GDP will help policy makers for decision making, especially as it pertains to the allocation of resources in the fight against the pandemic.

Future research can also improve this study by using the established indexes within the framework of understanding how one can improve resilience of G20 countries; moreover, it is worthwhile for future studies to provide insights into why some countries are lagging behind in terms of resilience and



why others are leading. Moreover, future research will require an exploration of all the G20 countries for a longer period, if data are available.

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#### Conflicts of Interest:

The authors declare no conflicts of interest.

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